

CLAIMS

The invention claimed is:

1. A method of making a semiconductor radiation emitter package comprising:
 - forming a leadframe assembly from a sheet of electrically and thermally conductive material, the leadframe assembly having a heat extraction element and a plurality of thermally resistive leads, at least one tie-bar connecting at least one lead to another lead;
 - bonding at least one semiconductor radiation emitter to the heat extraction element, each emitter having a plurality of electrical connection points;
 - forming an electrical connection between at least one electrical connection point and at least one lead connected to the other lead by the at least one tie-bar;
 - encapsulating the at least one semiconductor radiation emitter with a material substantially transparent to wavelengths emitted by the at least one semiconductor radiation emitter; and
 - breaking each of the at least one tie-bar.
2. A method of making a plurality of semiconductor radiation emitter packages comprising the steps of:
 - forming a leadframe assembly from a sheet of electrically and thermally conductive material, the leadframe assembly having a plurality of leadframes each including a heat extraction element and a plurality of thermally resistive leads, the leadframe assembly further including a plurality of tie-bars connecting said plurality of leadframes to one another;

bonding at least one semiconductor radiation emitter to each heat extraction element, each emitter having a plurality of electrical connection points; forming an electrical connection between at least one electrical connection point of said at least one said semiconductor radiation emitter and at least one of said plurality of leads of a corresponding one of said leadframes; and encapsulating said at least one semiconductor radiation emitter with a material substantially transparent to wavelengths emitted by the at least one semiconductor radiation emitter so as to create a plurality of interconnected semiconductor radiation emitter packages.

3. The method of claim 2 and further comprising the step of breaking each of the tie-bars to separate the semiconductor radiation emitter packages from one another.
4. The method of claim 2, wherein the leadframe assembly includes an additional tie-bar for each leadframe that couples together at least two of said electrical leads.
5. The method of claim 2, wherein the leadframe assembly includes an additional tie-bar for each leadframe that couples at least one of said electrical leads to one of said heat extraction members.
6. The method of claim 2, wherein said tie-bars couple together at least two of said heat extraction members.

7. The method of claim 2 and further comprising the step of forming at least one recessed cup in each heat extraction member and attaching the at least one semiconductor radiation emitter in said recessed cup.

8. The method of claim 7 and further comprising the step of coating each recessed cup with an optically reflective coating.

9. The method of claim 2, wherein said plurality of electrical leads for each leadframe includes first and second electrical leads, said second electrical lead is formed as an integral extension of the heat extraction member.

10. The method of claim 2, wherein said plurality of electrical leads is formed thinner than the heat extraction members.

11. The method of claim 2, wherein the thickness of the heat extraction members are formed to be at least three times the thickness of each electrical lead.

12. The method of claim 2, wherein at least one of said plurality of electrical leads for each leadframe is electrically isolated from the heat extraction member.

13. The method of claim 12 and further including the step of providing a tie-bar for each leadframe to connect each isolated electrical lead to one of the heat extraction member and another of the plurality of leads.

14. The method of claim 13, wherein said step of encapsulating includes covering a portion of each isolated lead with material.

15. The method of claim 14 and further including the step of breaking the tie-bar connecting each isolated electrical lead to one of the heat extraction member and another of the plurality of leads after the encapsulating step.

16. The method of claim 2, wherein said step of forming a leadframe assembly includes stamping the assembly out of an integral metal strip.

17. The method of claim 2, wherein each of the heat extraction members is constructed with a thick cross-sectional area normal to the path of heat flow away from the at least one semiconductor radiation emitter relative to the thickness of the electrical leads.

18. The method of claim 2, wherein each of the heat extraction members is formed with at least one of notches, fins, slots, and holes to increase surface area outside a portion of the heat extraction members to be covered with an encapsulant.

19. The method of claim 2, wherein each of the heat extraction members is formed in the shape of a plate.